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A Response Plan to Anthrax Exposure: Role of the Occupational and Environmental Health Nurse

by

Janice Butler Ryckeley

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Approved by:

_____
Judith S. Ostendorf, Advisor

_____
Susan A. Randolph, Reader

ABSTRACT

Biological agents are used for one purpose only: terrorism. The United States has struggled through the initial shock of September 11, 2001 when it experienced its first terrorism attack. In hindsight, the response was awkward, reflexive, and visceral in initial emotion; the time has now come to organize for long-term planning. Planning a set of effective responses matched with programming appropriate resources will prove challenging. One author suggests "We have not given adequate thought to the layers of these processes in biological defense" (Larsen, 2007, p. 7).

Occupational and environmental health nurses (OEHNs) are seeking information about biodefense practices, especially for planning and managing a Category A agent attack such as anthrax. Dr. Bonnie Rogers' (2003) systems model is a template that may be utilized to address the OEHN response to biodefense response planning.

The purpose of this paper is to describe the history of biological terrorism (bioterrorism), and review biological threats with a focus on anthrax, the most significant of the 6 Category A agents. This paper will also discuss federal agencies involved in biodefense preparation and explore the critical role of the occupational and environmental health nurse (OEHN) in developing tools and a logical, useful response plan to the threat of anthrax grounded in Rogers' conceptual framework.

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CHAPTER I

INTRODUCTION

The United States of America has experienced acts of terrorism in the past that have shocked American citizens. In September 2001, the use of the biological agent, Anthrax, caused the death of five people.

Anthrax is especially frightening because there are no warning signs, precursors, and no indicators until an attack has already taken place. Anthrax is identified as a Category A agent by the Centers for Disease Control and Prevention (CDC, 2009a; 2009b). It is not easily disseminated, but difficult to diagnose. Anthrax attacks the pulmonary, gastrointestinal, and dermatological systems and is difficult to differentiate because the symptoms are easily confused with those of influenza (Salazar, 2002).

The attack on September 2001 is known as the Amerithrax attack and was initiated by a Department of Defense (DoD) scientist, Dr. Bruce Ivins of Fort Dietrick, Maryland. Dr. Ivins became frustrated with the ethical limits of animal testing and decided to launch a clinical trial to evaluate the human response to anthrax exposure, a true mile marker in the history of biologic agents in the United States (US). Letters containing anthrax bacilllus were mailed to 2 senators and locations in Florida and New York. Scientists noted the specific genetic code associated with Ames anthrax. Within scientific circles, the Ames strain was exclusive property of the US biodefense community at Fort Dietrick, MD, which led to quick identification of its origin.

As unfounded reports circulated within government circles regarding credible American scientists, an anthrax expert, Dr. Barbara Hatch Rosenberg challenged the potential conflicts of interests within the Federal Bureau of Investigation (FBI) and DoD's stance in the case. Dr. Rosenberg was summoned to testify before a Senate Judicial committee. A FBI investigation identified Steven Hatfill as a "person of interest", but he was later cleared. By this time 5 people died, approximately 17 were seriously ill, and thousands were exposed to anthrax (History Channel, 2008). The impact of these attacks included two branches of the government shutting down temporarily including postal operations around the country. Eighteen individuals in five states contracted anthrax and became sick. More than 33,000 postal workers required post-exposure anaphylaxis. Costs to the US Postal Service approached $3 billion and two facilities, the American Media building in Florida and the Brentwood postal facility in the nation's capital, were shut down and remain closed. Clean-up costs were expected to exceed $24 million (Heyman, 2002). There is no way to measure the cost in terms of human lives, prevention of future attacks, and management of the Amerithrax attack.

The purpose of this paper is to describe the history of biological terrorism and biological defense, review anthrax as an "ideal" Category A agent, and describe methods of anthrax exposure, triage, treatment, and risk classification. It will also provide an overview of eight government agencies' biological response plans. These agencies include the National Security Agency (NSA), the Department of Health and Human Services (DHHS), Department of Homeland Security (DHS)/Federal Emergency Management Act (FEMA), Federal Bureau of

Investigation (FBI), Department of Defense (DoD), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and the American Red Cross (ARC). The lack of a unified command structure will be described. In the absence of a government coalition, nursing professionals must collectively address the topic of bioterrorism defense.

While the occupational and environmental health nurse (OEHN) realizes the potential for a biological attack, a biological response plan may not be in place. The role of the OEHN in the development of a response plan for anthrax exposure will be explored. Resources must be identified and applied effectively. Using the Rogers' systems model, the OEHN will address external and internal influences, inputs, throughputs, outputs, interventions, and feedback mechanisms. By utilizing this model, the biological response plan will be specific to the worksite. The OEHN has both the public health knowledge and corporate experience to take the lead in developing an anthrax response plan.

CHAPTER II

LITERATURE REVIEW

Much has been written about the effects of biological agents and biodefense; much less has been written about the planning requirements and management of such an attack, particularly from an occupational and environmental health nursing perspective.

Definition

The Department of Justice (DOJ) (2009), along with the National Institute of Justice and FBI jointly define bioterrorism as "the unlawful use or threatened use of force or violence against persona or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (para 3). The Centers for Disease Control and Prevention (2009a; 2009c) concur with this definition as part of the federal certification process of a terrorist event and use that definition as the basis of their evolving morbidity and mortality coding processes.

History of Bioterrorism

The history of anthrax-related terrorism by rogue professional survivalists against US citizens within the continental borders started with the killing five people in September 2001. There are varying opinions regarding the actual use of anthrax versus the perception or threat to use. According to Leitenberg (2005),

> There are four factual significant events involving biological agents, three of which involved anthrax. These incidents include the Rajneesh, The Dalles, Oregon use of salmonella on food in

> 1984, the Japanese Aum Shinriko's unsuccessful attempts to procure, produce and disperse anthrax and botulinum toxin in 1994, Al Qaida's unsuccessful efforts to obtain anthrax and to prepare a facility in which to do microbiological work in 2001 and the successful "Amerithrax" distribution of high-quality dry-powder preparation of anthrax spores in 2001. (p. 22)

The most recent event, the Amerithrax incident, involved an aerosolized white anthrax powder believed to be mailed by Dr. Bruce Ivins in Fort Dietrick, Maryland. Events such as mailing letters containing high grade anthrax to the Sun Newspaper in Florida and to Senators Daschle and Leahy closed the Hart Senate Office Building for months. CBS, NBC, and ABC television networks received letters filled with anthrax, and staff for Tom Brokaw and Dan Rather contracted the cutaneous form of the disease. Biological attacks remain dangerously elusive; there are no warning signs, precursors, ominous changes, and no indicators until the attack had already taken place. The threat to life was and remains real and exponential. A Nobel Laureate in microbiology, Dr. Joshua Lederberg (2002) believes, "Today one man can make war. A lucky bio-buffoon could kill 400,000 people" (Larsen, 2007, p. 57). Larsen writes that while the intent or capability of fanatics may not be controlled, the consequences may be managed by "containment" (p. 82). Larsen further submits his belief that through "investing in research into vaccines, treatments, and building a public health and care delivery system that can rapidly detect and treat an epidemic, we may contain an attack and its effects" (p. 118-119).

Category A Agents

The CDC (2009a) identifies six Category A agents or biological threat categories (in alphabetic order for reader convenience): bacillus anthracis (anthrax), clostridium botulinum (botulism), yersinia pestis (plague), variola major (smallpox), francisella tularensis (tularemia), and viral hemorrhagic fever (lassa fever, dengue, hanta, marburg, ebola viruses, etc.). An "ideal biological agent" possesses twelve characteristics: pathogenicity to humans, animals, and plants; ability to produce severe disease; effectiveness at low doses; high disease rates; highly infectious; not necessarily contagious; aerosol transmissibility; availability of vaccines; easily and rapidly produced; size from 1 to 5 microns lends to aerosol delivery; concentrated, environmentally stable; and is easily weaponized (Lederberg, 2002).

The CDC (2009c) describes Category A agents, specifically anthrax, as "easily disseminated or transmitted from person to person with high mortality, potential major public health impact and public panic/social disruption; requiring special action for public health preparedness" (p. 1). As the threat of an anthrax attack increases, Bartlett (2002) cites three key factors for the waging of biological warfare: the desire to use it, ability to acquire it, and capability of delivery. While the threat of biological agents may not prove as probable as weapons of mass destruction or a suicide bombing, individually or collectively, these biological agents pose potential devastating and lethal blows to local, state, and national healthcare systems.

Anthrax Exposure

Anthrax, which attacks the pulmonary, gastrointestinal, and dermatological systems, is well-known as a formidable biological agent with small, sturdy, stable, easily aerosolized, and dispersed spores. Salazar's (2002) work with this agent reveals it is easily confused with influenza. From practical experience with the threat of inhalation anthrax within the halls of Congress in 2001, one occupational and environmental health nursing expert reported multiple challenges associated with the process of diagnosis protocols and "nasal swabbing" technique for individuals in potential "hot zones". Initially, frightened and confused, those "hot zone" candidates received briefings, counseling, phone hot lines, and a sixty day trial of antibiotics to effectively treat a suspected, but unconfirmed anthrax attack (Anderson & Eisold, 2002). Anthrax is a highly effective respiratory agent, immobilizing humans with a severe pulmonary infection, leading to septicemia and death. The spores lodge in the alveolar spaces and are destroyed in part by the macrophage response; the remaining spores are then transported into the lymphatic system where they germinate in about 60 days, replicating bacteria release with at least two well known toxins (edema and lethal factors) that lead to disease. OEHNs must learn to recognize the circumstances of a potential exposure and assess initial symptoms of influenza-like illnesses which might include an anthrax exposure.

Anthrax is most dangerous through inhalation exposure. A few kilograms can kill as many people as the Hiroshima-size nuclear weapon. Transmission from person to person is of little concern. Use of chest X-rays, blood cultures, and

gram staining for *Bacillus Anthracis* are the most effective diagnostic tools available (Salazar, 2002).

Triage

The process of triage becomes critical as levels of worker acuity are prioritized against resources with increased time demands for additional tests, exam area decontamination, and communication with the National Response Center and CDC creating time delays. Dr. Lee (2007) recommends observance of standard precautions in handling patients, clothing, and body fluids. "Isolation" differs from "quarantine". Effective isolation of known, infected patients requires segregation from the healthy, an immediate priority. "Quarantine" addresses general bounds placed on an exposed, but still healthy population. Healthcare providers, clinicians, staff, firemen, and law enforcement take priority in receiving care in order to manage the exponential number of "worried well" and "walking wounded" (Lee).

Treatment

Treatment for anthrax exposure means immediate dosing with antibiotics such as ciprofloxacin and doxycycline for up to sixty days (Salazar). The National Institutes of Allergy and Infectious Diseases (NIAID) conducted two toxin studies which promise leads in developing two new antimicrobial anthrax drugs. Even with treatment, the historical fatality rate is 75%. Without mechanical respiratory support, death occurs typically within 24-36 hours. There is currently no screening test. The vaccine, anthrax vaccine absorbed (AVA), is reserved for protection of military personnel in high-threat areas (National Institutes of Health/

National Institute of Allergy and Infectious Diseases [NIH/NIAID], 2002). It is incumbent upon all OEHNs to know and understand the routes of exposure, treatment, and how to access public health resources.

Risk Classifications

The Occupational Safety and Health Administration (OSHA) (2009b) establishes foundation information for the OEHN by identification of risk classifications for an anthrax attack cited as red, yellow, and green zones in descending order of risk. In the event of an exposure, the OEHN should understand the concepts and context behind the application of these OSHA designators within their worksite. Red zones are defined as worksites where emergency response is in progress or contamination has been confirmed. Yellow zones are worksites where bulk mail is handled, areas in close proximity to contamination or potential terrorism targets. Green zones are relatively low risk and consist with most worksites in the country. As the exposure plan is developed, this information should be part of the plan. As the OEHN teaches the exposure plan to worksite staff, this information should be part of that education process.

CHAPTER III

EXPOSURE MANAGEMENT

Evolution of a National Response

The potential risk for biological agent attack and exposure is currently limited to hypothetical modeling and a handful of unclassified exercises; the topic is culturally unthinkable to the average American. Biological defense forums have sprung up throughout the country since September 11, 2001. Although the government efforts appear well-funded in general, the literature reveals immature, poorly coordinated processes and weak efforts in planning, policy, research, education, and ultimately practices and processes (Larsen, 2007). As forums congregate to study the requirement to plan and execute rapid response, the requirements for organizational agreement, consistency, and coordination are obvious.

Research Laboratories

While citizens read about bioterrorism issues in general terms, new research laboratories are quietly being planned, programmed, funded, and constructed with little fanfare throughout the country. These facilities, graded as biosafety levels 1 through 4, focus on research in high-risk biological threats and are located at the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia; an unnamed facility in San Antonio, Texas; an unnamed facility in Hamilton, Montana; the United States Army Research Institute of Infectious Diseases (USAMRIID) in Fort Dietrick, Maryland; the National Emerging Infectious Diseases Laboratories at the Boston University Medical Center; and at the

University of Texas Medical Branch in Galveston, Texas. Charged with researching biological agents and developing vaccines, these facilities provide highly secure, redundant isolation chambers. The design of these facilities allows staff to work at ease with personal protective equipment (PPE) as they study deadly agents, such as anthrax, and their infectious processes (NIH/NIAID, 2007).

One of these research facilities, USAMRIID (2004) is now associated with the infamous "Amerithrax" investigation with the suicide of Dr. Bruce E. Ivins of Fort Dietrick, Maryland on July 31, 2008. An anthrax authority for 35 years within the federal government, this scientist was awarded the 2003 Decoration for Exceptional Civilian Service, the highest honor given to DoD civilian employees, for his work in anthrax. Dr. Ivins performed significant research on various combinations of anthrax strains to optimize an effective vaccine. Allegedly, he became frustrated with the constraints of research on animals versus humans and is believed to have mailed anthrax spores to prominent members of the Senate, newsrooms, and public places in 2001 as part of a spurious human test project. The FBI was investigating and preparing charges for five deaths associated with the mailing of anthrax through the postal system. With a long known history of making homicidal tendencies since college days, Ivins was under psychiatric evaluation for stalking and making death threats to a numerous individuals. His family stated he had been the focus of relentless FBI surveillance and investigation since 2002 when the United States Attorney General named him a "person of interest" in association with Steven Hatfill who was later cleared of

charges. With Ivins' death, the Department of Justice is considering closure of the "Amerithrax" investigation, pending more suspects (Fox News, 2008).

There is a preponderance of literature addressing the history of biological threat in the US. From the public health officials at the CDC to private experts, such as retired Colonel Randy Larsen, United States Air Force, there is much conceptual knowledge on how to manage the threat of anthrax. There is less written on the specific and actual application of practical knowledge in dealing with anthrax. There is even less written on protection of individuals and worksites.

Government and Private Training Events

Numerous government and private training events have demonstrated the advantages of partnering as they test and improve mutually beneficial joint programs. A federally funded training event, Top Officials (TOPOFF) 3, illustrates the benefits of collaboration in supply management knowledge (New Jersey Center for Public Health Awareness at University of Medicine and Dentistry of New Jersey [NJCPHR at UMDNJ], 2005). Colonel Randy Larsen states that the form and substance of such planning stems from "asking the right questions" in the beginning of planning for a biological attack (Larsen, 2007, p. 125).

Larsen emphasizes,

> Our disjointedness and ineffectiveness in planning for a biological attack lies in the failure to address core issues such as personal survival such as the "ability to survive and operate" (ATSO) linked

> to our ability and willingness to think through and periodically exercise the expectations and processes of a useful, multipurpose all hazards plan to an 85% solution (p. 199).

He simplifies the process by illustrating the personal resources an individual would need to survive and then amplifies those resources to organizational levels in the private and government sectors. Two examples which might be examined include the technology behind WalMart's "just in time" distribution networks and individual infrastructure models as evidenced with Hurricane Katrina in New Orleans (Larsen, 2007). During this event, WalMart implemented their emergency logistics/supply software and processes to provide shelter, food, and necessary supplies to the Gulf Coast when it was needed (Walmartstores, 2008).

There is a distinct void in planning and resourcing through government and private sector readiness and organizational roles and individual responsibilities.

Agencies Involved in Biodefense Preparation

There are 57 federal agencies, 50 states, 8 territories and 3,066 counties involved in homeland security. For the sake of brevity and relevance, eight government bodies and their relationships in biodefense are described.

National Security Agency (NSA)

The NSA is the premier US intelligence community located at Fort Meade, Maryland. The NSA originated from the DoD's Armed Forces Security Agency in the late 1940s. Due to the level of national security concerns, the website

identifies assurance, encryption, and decryption as their primary missions. Little information is publicly posted or known concerning bioterrorism planning efforts within this agency. Criticized by Congress for a void of Congressional oversight, the NSA has been under scrutiny for failure to adapt to a post Cold War environment and overzealous monitoring and intrusion into privacy of individual citizens (National Security Agency [NSA], 2008).

Department of Health and Human Services (DHHS)

The DHHS sponsored their first anti-bioterrorism initiative in 2000. Within the DHHS (2008), the CDC is the premiere national antiterrorism health agency. The CDC addresses the epidemiology, exposure pathways, and environmental sources, to establish treatment regimens. Questions now arise regarding change to this approach with the deliberate spread of a virulent biological agent (Massachusetts Institute of Technology [MIT], 2008).

Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA)

The DHS is rich in examples of lessons learned. There have been many examples of successful modeling with simulation and exercise planning and execution to include TOPOFF, TOPOFF 3, and more recently the TOPOFF 4 in Connecticut and New Jersey (NJCPHP at UMDNJ, 2005; New Jersey Business Force, 2007). The Department of Homeland Security and the DoD have sponsored exercises such as the TOPOFF program since 2003 (NJCPHP at UMDNJ). TOPOFF involves an arduous two year cycle of seminars and planning sessions resulting in assessment of the "nation's capacity to prevent, prepare for, respond to, and recover from terrorist activities involving Weapons of Mass

Destruction (WMD)" (New Jersey Business Force, 2007). Believing that private businesses (to include health systems) and government functions (to include public health resources) can complement each other, TOPOFF 4 involved the private sector to assess/test their internal level of preparation with a table top exercise, use of virtual news networks, computer firewalls, and local business, communication, and environmental constraints.

As a result, the Business Emergency Operation Center (BEOC) was created. Jointly planned, designed, and developed with private and retired corporate managers and military talent, this center developed a scenario where participants had to address and continuously prioritize and re-prioritize immediate, post-attack priorities:

1. What is my number one priority?
2. Who do I turn to for credible information?
3. On what type of information do I base decisions?
4. What to tell staff and employees?
5. Where is the nearest shelter?
6. With whom can I share information collected?
7. Can employees get back and forth to work and how?
8. Where is the policy for treating contaminated employees?

(NJCPHP at UMDNJ, 2005)

Roadways and highways outside the affected areas were gridlocked. Red Cross volunteers set up shelters for aid and resources. On the next day of the exercise, some success in resource recovery was appreciated in decontamination

efforts; re-occupancy of enterprises, schools, universities, and government offices; reopening of major highways, airports, and waterways; restoration of utilities; reestablishment of supply chain and revenue stream; reemergence of healthcare recovery, addressing large scale physician and mental health needs; and lastly, restoration of citizen and employee confidence (New Jersey Business Force, 2007). At the conclusion of TOPOFF 4, the evaluators recommended the following "lessons learned". They addressed how to integrate the BEOC model into coordinated government responses, the BEOC systems into existing software systems, and to develop a microcosm of sub-systems to fill information gaps versus individual systems. They addressed specific experiential learning for all employees, such as employee emergency procedures and readiness to respond, all of which seems intuitively obvious (New Jersey Business Force). However, this was not the case. Learning took place in the private sector as evidenced during Hurricane Katrina. Improvements in the private sector, such as WalMart, demonstrated commendable logistics and distribution models which managed and utilized information from which the entire nation could learn and benefit (Larsen, 2007).

These exercises, incorporated into the National Response Plan, the National Incident Management System, and software/technology for dealing with specific hazards, are invaluable in lessons learned (Department of Homeland Security, 2005). After-action reports revealed many opportunities to learn from weaknesses and response to a biological attack. TOPOFF 3 results stated the concept of points of distribution for medications (PODS) was flawed within the

exercise. Vulnerable to internal contamination, the PODs became a logistical nightmare. Other flaws included the inability to accommodate the breadth of fourteen languages spoken in northern New Jersey and Connecticut, the United Kingdom, and Canada, and difficulties of compliance with the Americans with Disabilities Act. Within the scope of the exercise, participants were mixed in their awareness of the biological agent with some factions wearing personal protective equipment while others did not. This skewed the triage process and ultimately contaminated the PODs with participants of unknown exposure and delayed symptoms. Recordkeeping became an insurmountable challenge. Logistics to feed volunteers became a huge obstacle, particularly in the face of a second attack. The unspoken message: "our resources do not stretch to that extent" was noted over and over (NJCPHP at UMDNJ, 2005).

Federal Bureau of Investigation (FBI)

The FBI is the primary governmental agency solely tasked and responsible for anthrax investigations. Therefore, "the FBI has a vested interest in the careful development of judicial burden of proof beyond a reasonable doubt in its investigation of a crime scene when bioterrorism agents are used" (Larsen, 2007, p. 55). They currently lack the relevant scientific background to interact effectively with the CDC which is focused on the epidemiology and pathways of exposure, index case, and public health procedures. According to Larsen, "the FBI suspected a domestic terrorist in Amerithrax from the beginning and was proven correct" (p. 51). The FBI has posted detailed information regarding the Amerithrax scenario on their website with details of their investigation in

unsealed court orders (DOJ, 2008). Five years after Amerithrax, "America had and still has no plan for responding to an attack with anthrax, the most likely biological weapon terrorists will use" (Larsen, p. 275).

Department of Defense (DoD)

The DoD has an extensive history of dealing with biological agents and has experience in the first mustard agents hurled at infantry soldiers in World War I. The USAMRIID (2005) at Fort Detrick, MD is the Army's research center for biological agents. It organizes and maintains biological agent treatment regimens with emergency hotlines and on-line handbooks for healthcare providers. The DoD shares access to FEMA's nationwide hospital bed database. However, bioterrorism plans and information are cloaked in security hindering open and joint cooperation with other federal agencies. In the annual report of level of readiness to Congress, the DoD projects available resources will likely be scattered, particularly in pulmonary care and support services. Equipment supplies are limited, even within the field DoD stockpiles. Transportation availability will not match the scale required; therefore, valuable beds within local hospitals will likely remain occupied and patients will queue into longer and longer lines for care. Should a biological agent attack occur, the federal government will augment the efforts of local hospitals, not supersede them (Siegrist, 1999). This presents an ominous situation for local healthcare systems and experts with plans shielded from the public domain. In conclusion, the DoD website cites 45 specific references to anthrax and bioterrorism (DoD, 2008).

Occupational Safety and Health Administration (OSHA)

OSHA has a highly developed and well organized website for management of biological agents, including anthrax. Focused on attacks in the workplace, OSHA has effectively linked their technical and regulatory information with the CDC and U.S. Army Surgeon. OSHA offers detailed information to the public and the professional on how to recognize, plan, and treat exposures in a biological defense scenario. Currently there is an ongoing effort within OSHA to guide healthcare facilities through the process of anthrax planning with the formation of electronic tools, templates, and guidance (OSHA, 2003). Their expansive Anthrax website addresses risk factors, excellent planning processes, first responder management, and clean-up recommendations (OSHA, 2009a).

Environmental Protection Agency (EPA)

A detailed strategic plan is posted on the EPA website (EPA, 2008a). There may be classified planning for bioterrorism attacks, but those plans are not in the public domain. Their website has the search engine capability for 575 potential anthrax topics (EPA, 2008a; EPA, 2008b).

American Red Cross (ARC)

The American Red Cross (ARC, 2009) is a private, non-profit agency. It is chartered to:

> carry on a system of national and international relief in time of peace and apply the same in mitigating the sufferings caused by pestilence, famine, fire, floods, and other great national calamities and to devise and carry on measures for

> preventing the same. The charter is not only a grant of power, but an imposition of duties and obligations to the nation, to disaster victims and to the people who generously supply its work with their donations. (p. 1, para 1-3)

The ARC provides food, shelter, and health resources with emphasis on mental health needs to enable individuals and families to return to their normal daily activities independently (ARC, 2009). There is a set of plans made public on their web page for 16 individual environmental disasters, one of which is terrorism. The ARC received over a billion dollars in private and public funding since the September 11, 2001 attacks on the World Trade Center known as the Liberty Disaster Relief Fund. The ARC created the September 11 Recovery Program (SRP) to provide longer term services for 3 to 5 years to non-profit agencies through the Recovery Grants Program for people whose lives were most seriously disrupted in the communities where they work and live. These funds address basic access to healthcare, diagnosis and treatment, mental health requirements, recovery, and strategic funding (American Red Cross, 2008). There are links to the CDC and specific plans in place for 16 natural disasters. While terrorism attacks are mentioned, little is specific for biological defense.

Management of disaster relief is a monumental task. The scope of resource management responsibility is staggering. One of the ironies of September 11, 2001 within the ARC disaster relief lies in the overwhelming asymmetrical drain versus influx of resources. Evidence of this is in the large amount of blood donated by thousands of generously patriotic Americans after September 11,

2001. Larsen (2007) attests to the irony associated with such a magnanimous response that was undermined by current standards, writing "when the 42 day limit was reached, this invaluable resource was destroyed" (p. 212). There was simply no way to use it all. Such is the speculative, uncertain ebb and flow of resources in disaster management.

A friend of the ARC and one of their community partners, WalMart, made donations of $1 million during Hurricane Katrina as well as donated truckloads of supplies to victims in Louisiana, Mississippi, and Texas to supplement ARC efforts (Barbaro & Gillis, 2005).

The sparse knowledge and concentration of efforts in current biodefense practice, planning, policy, research, and education is recognized. The time is overdue for the eight federal and national agencies to assemble, pool, and integrate their resources and abilities. Current awareness of the National Security Agency, Department of Health and Human Services, Department of Homeland Defense/Federal Emergency Management Agency, the Federal Bureau of Investigation, the Department of Defense, Occupational Safety and Health Administration, the Environmental Protection Agency, and the American Red Cross is limited to the public domain. It becomes more obvious that each of these departments, agencies, and organizations must organize their collective resources and capabilities into a cooperative and collaborative plan. As planning evolves and develops in the upper echelons of federal and state government, the OEHN has the opportunity to secure a key role in planning the bioterrorism response at the worksite by addressing policy, research, education, and practice requirements.

As a specialty nursing group, OEHNs must bring education to the process "by posing the right questions and searching for effective answers in everyday language for the employee and community residents. This process stems from knowledge and education" (Larsen, 2007, p. 125).

Gap Analysis

There are significant gaps in the current business practices within the government agencies cited above. What is known about the current state of the eight organizations is scattered and certainly not linked organizationally or operationally. According to Larsen, "there is no unified command structure nor responsible body in the government for a biological attack" (p. 129). There are websites, some of which provide open information, with links to relevant information scattered among the eight organizations. Larsen writes that the "public and private sectors currently possess their specific models of leadership and logistics which would serve as powerful role models for the ability to survive and operate (ATSO)" (p. 213).

One example which substantiates excellent response planning in the private sector is WalMart. In the summer of 2005, a category five hurricane, Katrina, struck the coast of Louisiana, Mississippi, and the Gulf Region devastating that corner of the country for months. WalMart's emergency response and logistic plans for aid to those disaster stricken communities was well planned and orchestrated with positive community outcomes documented (Barbaro & Gillis, 2005).

According to Horowitz (2009), WalMart believes the best time to plan disaster relief is prior to the disaster. They make their proactive community awareness part of their marketing strategy. WalMart sent management and staff to individual storm stricken areas along with millions of dollars in donated merchandise to hurricane relief sites. Using their "emergency operations center" which is responsible for mitigating, preparing, and planning the company's response to all forms of disaster, WalMart initiated their "just-in-time" logistics system. "Just in time" means they track the trends in items needed via logistics system of forty regional distribution centers capitalizing on advantageous metropolitan locations to support 75-100 stores within a 250 mile radius (Horowitz). Clearly, the WalMart emergency operations center has established a successful strategy of dealing with supply distribution to disaster areas. They are proud of their history of community disaster aid efforts and reputation (Walmartstores, 2008). First, during Hurricanes Katrina and Rita, WalMart contributed $17 million to aid emergency relief efforts to the ARC, the Salvation Army, the Texas Governors Fund, and the Bush-Clinton Katrina Fund. Second, they also provided $9.2 million in cash assistance to more than 20,000 associates affected by the hurricanes. Third, they raised more than $7 million in public contributions made by customers and employees at over 3,800 locations to include Sam's Clubs. Fourth, they raised over $20,000 in animal relief efforts following both hurricanes (Walmartstores, 2008).

There are significant gaps between the government and private sector. There are few, if any, shared goals, coordination, and effective interaction among the

eight government organizations. The private sector such as WalMart conducts business with simple principles such as operations, logistics, and supervision executives sitting next to each other to coordinate business practice changes and issues, with the example given: "I need ten trailers of water… I have it available…I can get it there: a practice of joint interaction and cooperation from which federal government might learn and benefit" (Hayes, 2009, para 1). Larsen (2007) writes that when he noted the void of coordination and isolationism in the federal government, he posed a similar question to another biodefense expert: is there a database that he could identify and track federally funded programs in biodefense, the answer was "no" (p. 129).

One recommendation is to "form a directorate for biodefense which would overhaul and reorganize both security and intelligence capabilities into one joint and cohesive organization similar to the Goldwater-Nichols Act of 1986" (Larsen). This act forced the branches of the military out of self-serving partisan political arenas, rewarding higher levels of joint interaction within the DoD (Larsen).

Requirements for the biodefense directorate would include professional credibility, selection by the president with Senate confirmation, authority on the level of the director of national intelligence with direct power over complexities such as policy, personnel, and spending programs, and lastly, once the president declares a national emergency, the authority to step in as advisor and "combatant commander" for that arena, similar to the Central Command in Iraq. "Proactive planning demands this work be done prior to an attack; history teaches that this

action will likely not take place until an actual attack occurs with public outcry for an improved, effective response (Larsen, 2007).

Furthermore, this directorate must be placed outside the beltway to serve the distinct interests of democratic process, much like the Base Realignment and Closure Commission (BRAC) which streamlined Department of Defense efforts in the early 1990's through the present. Key to this concept is the management of information to include intelligence, information systems, and public/private databases (Larsen). Unlike the CIA, this concept would include formation of a specific, unified, formal, domestic biodefense intelligence function within the geographic boundaries of the United States. Ironically, this effort would also force a double edged sword of awareness and information gathering into both current national readiness arena and intrusions into the realms of individual civil liberties and personal privacy (Larsen).

CHAPTER IV

THE OCCUPATIONAL ENVIRONMENTAL HEALTH NURSE (OEHN) ROLE IN DEVELOPMENT OF A RESPONSE PLAN

Health professionals and specifically nursing tend to cling to the safety net of "knowns", a wealth of original, parochial nursing knowledge and experience. However, little of this knowledge prepares the United States for a biological attack.

The OEHN is in a key position to develop the organization's bioterrorism disaster response plan. The planning processes must reflect clear, practical, and organized directives to communicate the response plan to employees. Larsen (2007) discusses the individual requirements for survival of a biological attack. Taking this information from the individual level to the organizational level requires working well with others, the ability to identify priorities, and a plan that the organization can implement and employees will respect, i.e., the "ability to survive and operate" or "ATSO" (Larsen, p. 190).

Emergency Action Planning

As a trusted advisor to employees, the OEHN's advice must be sound, current, and credible. The OEHN should know the effects of a biological agent exposure, develop and update worksite readiness plans, and teach employees how to take cover with appropriate shelter and personal protective equipment. The Occupational Safety and Health Administration (OSHA, 2003) illustrates in Table 4.1 how to develop an emergency action plan complete with details of emergency

TABLE 4.1

EMERGENCY ACTION PLANNING

Item	Action
Emergency identification	▪ Provide guidance on how to recognize a potential emergency situation or suspicious mail
Initial actions	Upon identification of a potential anthrax threat or release: ▪ Isolate the area; minimize exposure to others ▪ Turn off fans, ventilation units; shut down air handlers ▪ Document who came in contact with anthrax for public health/law enforcement authorities
Authority notification	▪ Dial 911 for fire/law enforcement ▪ Notify the National Response Center at 1-800-424-8802 ▪ Inform senior management and building owners
Internal notification	▪ Use alarm system to evacuate the building and/or take other actions
Evacuation policy	▪ Develop policy, procedures, and escape routes assignments to familiarize employees with expectations, evacuation routes, and gathering points
Employee Accountability	▪ Incorporate procedures to account for employees after the evacuation to ensure everyone got out
Organizational structure	▪ Define employee roles and responsibilities in the event of an emergency
Employee training	▪ Describe how employees will be informed of the contents of the plan and trained in their roles and responsibilities
Contact information	▪ List names, titles, departments, and phone numbers of employees who can be contacted for additional information or clarification of some aspect of the plan
Off-hour contacts	▪ Identify key personnel who should be contacted during off-hours
Emergency drills	▪ Conduct emergency drills to help ensure that the EAP actions are carried out properly and safely

Source: Adapted from OSHA, 2003

identification, initial actions, authority notification, internal notification, evacuation policy development, employee accountability, organizational structure, employee training, contact information, off-hour contacts and emergency drills. Most importantly, OSHA gives a phone number for the National Response Center (NRC) to alert appropriate parties responsible for mitigating a biological attack.

The time to plan and prepare a response which effectively manages routine and emergency employee health and well-being is before the attack occurs. The OEHN is positioned to influence the readiness posture of the organization via planning, budgeting, developing, teaching, and reinforcing the practical aspects of a response plan to all levels of management. For example, "bioterrorism information sound bite" could be presented at monthly safety meetings based on the nursing process: assess, plan, implement and evaluate.

Assess

What is the current bioterrorism/security climate? What are the current threat(s) to the worksite and employees? One of the core skills in the emergency planning process requires the ability to recognize and assess an emergency situation such as an anthrax exposure. Essential skills include the ability to recognize signs and symptoms and to triage the exposed employee into an appropriate care area (Lee, 2007).

Plan

Is there a written plan? Senior management and building ownership should be aware of the resources, processes, and procedures needed for those threats if they

happen. The plan should state how to coordinate with local authorities, fire response, and public health as well as the National Response Center at 1-800-424-8802. Located in Washington, DC, the National Response Center is a 24/7 call center for reporting suspected bioterrorism activity chaired by the Environmental Protection Agency and the United States Coast Guard (OSHA, 2003).

Implement

The implementation phase should be simple and straightforward in the beginning, improved with subsequent practice, and practiced annually. For example, there should be a schedule for exercising the plan with an anthrax exposure. Employees must know who authorizes an evacuation, the circumstances under which an evacuation would be ordered, how to exit their building, and their designated gathering point. There should be an alarm system to evacuate the building with established processes, polices, procedures, and pre-designated escape routes identified. Accountability with a roster to departments, titles, and phone numbers for organizational control is key to sound information management. This list should include key personnel off-duty phone numbers. Employee roles and responsibilities should be identified for organizational command and control, communication systems, and expected behaviors and actions (OSHA, 2003).

Evaluate

Process improvement is part of the expectation of practice. What was learned after the exercise? Were breaks in process or areas for improvement noted?

Those breaks in process must be addressed in safety and occupational health committees (OSHA, 2003).

The OEHN must be familiar with public health resources, knowledge of anthrax as a disease process among other Category A agents, recognition of signs and symptoms of exposures, and appropriate response to potential exposure at the worksite. An electronic template on the OSHA website can be used to develop a response plan (OSHA, 2003). The OSHA emergency action plan template can be compared to the Rogers' Model in order to address a biological attack from a multi-dimensional systems perspective.

The Rogers' Model

The Rogers' model addresses assessing, analyzing, and developing health and safety programs and may be utilized in planning for a biological attack (Rogers, 2003). Using the model as a template, the response plan should address biological factors and environmental influences including technology, economics, population, healthcare trends, and legislation (regulation/politics) via systems theory with relationships among inputs, throughputs, outputs, and feedback. The Rogers' model, illustrated in the Appendix, captures all of the dimensions required for expanding and developing sound occupational and environmental health nursing practices within the context of the bioterrorism environment.

Environmental Influences

Rogers states that the context of environmental influences includes a host of factors (Rogers). While Rogers originally focused on the environment of work, occupational hazards, and the role of the OEHN, Rogers' model is easily

expanded into a different application addressing the practice of occupational and environmental health nursing within the arena of biological terrorism. Perhaps the easiest depiction of this concept is found in her model which examines the following components of environmental influences: technology, economics, population/healthcare trends, and legislation (regulation/politics).

Technology

The Internet provides a powerful source of information regarding biological defense. The CDC, OSHA, and other agencies have organized their information in easy-to-manage links for the public domain. There is software development in biodefense decision support and critical thinking processes within the DoD, but it is not available to the public. As the OEHN looks at current professional responsibilities, the nurse must also examine baseline professional practices, update knowledge, and adjust planning for increasing levels of security within the worksite. Today's plans determine tomorrow's outcomes.

Communication systems, including the Internet, provide unprecedented access to information about anthrax and general biological defense. However, in the potential absence of electrical power during a biologic attack such as anthrax, clear, well-designed, and established manual processes are the key to success to a successful response plan.

With the known vague clinical presentations associated with anthrax, the OEHN can expect delays in diagnosis, treatment plans, and associated morbidity and mortality. The "walking wounded" and "walking worried" will complicate the scenario and place increased demands on healthcare professionals and

resources as information is processed to make appropriate decisions (Lee, 2007). Triage of injured and ill patients will require rapid and astute decision-making. If generator power and batteries for laptops are not available, manual tools such as checklists and data boards with which to identify processes, resources, and triage decisions should be kept current and available in the event electronic information systems are not available. However, these processes ideally should be automated into a database for tracking capability, identifying acuity, obtaining physician orders, completing associated work processes, making appropriate plans for nursing care, and identifying work-related hazardous risks.

Economics

The OEHN must address, incorporate, and integrate processes and policies into a planning function to address the requirements for and response to an attack. The nurse is responsible for effectively managing resource consumption involved in such planning. Business costs will increase, particularly as knowledge of potential exposure to anthrax become more accepted as reality.

Rogers (2003) states that the economic resources available to an organization drive the overall health efforts within that organization. An example of mismatching of preparation versus demand is Hurricane Katrina. Larsen (2007) states that FEMA failed to deliver effective and efficient services to the front lines in Hurricane Katrina. FEMA is in a growth state and still demonstrates a "less than mature" public response posture for a potential anthrax attack.

Rogers notes that the core of occupational health professionals in the workforce are registered nurses. The OEHN works with occupational medicine

physicians who frequently contract with worksites. Jointly, they bear the responsibility to develop appropriate programs to include planning for biological attack, including anthrax. As a professional, a process stakeholder, and trusted site leader, it is natural for the OEHN to lead and initiate bioterrorism defense processes and practices, while consulting with the physician as needed.

Population/Healthcare Trends

The Rogers' model can be adapted to address the threat of bioterrorism among population and healthcare trends (Rogers, 2003). The demographics in the worksite can span three generations with differences in how they view the world, politics, healthcare, and the work environment. The aging population is growing and many continue to work beyond age 65 due to economic conditions. There are more female workers in the workforce. The ethnic influences of Caucasian, African American, and Hispanic cultures are in the workplace. With these demographics, there is increased prevalence of co-morbidities to include hypertension, heart disease, stroke, diabetes, and cancer in the workplace.

From a community point of view, the potential for violence exists. It may stem from societal changes, potentially poor supervision and management practices, grieving employees, illicit substance abuse, and availability of weapons (to include real and imposter biological agents).

Legislation (Regulation/Politics)

There are statutes, laws, and regulations on federal, state, and local levels that pertain to biochemical preparedness in the workplace. On the federal level, OSHA regulates the occupational safety and health arena with its worker

standards and guidelines, some of which address biochemical preparedness and hazard communication. There are 22 states and jurisdictions that operate their own state occupational safety and health programs with job safety and health standards that are "at least as effective as" comparable federal standards. Knowledge of process in the evolution and development of statutes, laws, and regulations is an effective and powerful tool.

The OEHN must maintain an active and unrestricted nursing license as required by the state board of nursing, and practice nursing in accordance with its law and rules. With the influx of media attention on public health, terrorism, and funding cuts, the OEHN must stay abreast of lobbying activities through active membership in professional nursing associations to express a voice in professional decision-making. To learn the important organizational power infrastructure and dynamics, the OEHN must interact effectively with other peer groups and influence appropriate change in practice, biological exposure preparation, and health promotion.

Inputs

Corporate Culture/Mission

With a corporate infrastructure built prior to the threat of terrorism, formerly disinterested organizational cultures are now forced to deal with bioterrorism issues through regulatory directives. Work philosophies will change as people and organizations learn more about bioterrorism, and in turn, update their policies and procedures. Organizational culture will adjust with the expansion of knowledge into practice (Rogers, 2003).

Workforce

As a whole, the workforce across the nation is already affected by bioterrorism attacks with increased security concerns, particularly within the federal government and the transportation industry (Rogers, 2003). Employees will feel more secure in their worksite if they know how to respond to a simple and well rehearsed, clear, succinct bioterrorism response plan.

Work Processes and Related Hazards

In the face of a potential attack, the requirement for solid understanding of worksite processes and process improvement requires knowledge and advanced education for the OEHN (Rogers, 2003). There is an increased likelihood of a biological attack, and the prospect of managing an anthrax exposure with an aging worker population makes this all the more challenging. Healthcare providers need to incorporate common sense "how-to" applications into policy, planning, and practice to respond to a biological attack.

Human/Operational/Capital Resources

An anthrax attack will be expensive. People fear what they do not know and what they do not understand. Consequently, companies, agencies, and healthcare systems will become overtaxed because of the volume of people affected. Planning an appropriate response with the necessary resources such as a central command post, physicians and nurses, field locations, facilities such as tents, stretchers, and medical supplies/equipment requires a forward thinking team. The OEHN must be prepared with knowledge and well developed skill set to address

notifications, emergency response processes, and specific laws and regulations regarding occupational health (Rogers, 2003).

Informational Resources/Data

Accurate information and sound data are necessary to make effective decisions (Rogers). It is likely that manual record systems will be instituted. They could likely become the backbone of an organization's ability to survive an attack. Checklists and data boards in a central command post are instrumental in communicating with others.

Given the luxury of electrical power, automated record keeping will be inundated with data entry and data management requirements. Databases will be required and algorithms for diagnosis selection/treatment will be highly desirable. Networks will likely be slowed and overwhelmed by user demand for rapid information, if they are available.

Organizational/Occupational Health and Goals

Occupational health goals are congruent with organizational goals to insure a safe and healthful work environment (Rogers). The OEHN screens, approves, and teaches employees crucial and appropriate use of health principles and appropriate use of personal protective equipment in the workplace. In a single nurse unit, worker placement within the facility will be important with the most knowledgeable and clinically skilled employees handling triage and placement of the injured or exposed population.

Effective, detailed plans with well rehearsed practices will help survival and return to normalcy in the workplace. In the long-term, adequate

medical/healthcare and rehabilitation for ill and injured workers will be addressed with short-term and long-term disability. Addressing and optimizing the individual health of the worker/workforce is crucial to survive an anthrax exposure event.

Throughputs

Clinical, Analytical Skills, Knowledge, Experience

The competent OEHN instills knowledge and experience into staff and line employees equally (Rogers, 2003). The OEHN researches, presents, and teaches biological defense nursing principles to employees in a number of settings beyond staff and safety meetings such as walkthroughs, clearance for PPE, and routine interactions with employees. Integrating readiness into every day practice is the responsibility of the OEHN. For example, since the airborne anthrax exposure requires airway protection, it is incumbent that staff understands and demonstrates readiness in donning, wearing, and ultimately disposing of airway equipment.

Collaborative Decision-Making Skills and Processes

Organizationally, the OEHN and the occupational healthcare team collaborate in decision-making and organizational processes (Rogers). Thought must be given to the employee's level of knowledge, current response, and goal expectations during an anthrax exposure.

Interpersonal Negotiation Skills

The OEHN must have positive interpersonal and negotiation skills with colleagues and staff to optimize success in developing a response plan for the worksite (Rogers). These professional interpersonal skills are required to win,

appropriate, allocate, and manage time, human resources, and technical and funding resources to accomplish basic biological readiness goals.

Program Management and Objectives

The OEHN should lead and coordinate the response model management functions which involve employee health to insure that all systems are included (Rogers, 2003). Examples are budget planning, clearance for management of hazardous waste operations, and safety and environmental activities.

Documentation, Policies, and Procedures

The OEHN is in a leadership positions within the worksite (Rogers). As the response model is developed and implemented, individual understanding of the bioterrorism response plan, tasks, and expectations is crucial. Every employee, from CEO to the newest employee, must be aware and willing to cooperate in the response model process.

Interventions

Clinical Scope of Practice

The demands of bioterrorism on everyday life require the OEHN to adapt her/his nursing practice accordingly. Bioterrorism elevates the practice of occupational and environmental health nursing to a more active advanced role in recognizing and effectively treating signs and symptoms of anthrax. Management of early signs and symptoms of the disease will require finely tuned acute care assessment skills. As evidenced by Dr. Lee's (2007) work, many internal medicine physicians were not only aware, but were also quite accurate in their

early diagnosis, treatment, evaluation, and team planning in the aftermath of the 2001 anthrax scare. The same will be expected of the OEHN in the future.

In the aftermath of an attack, experts forecast a huge demand for mental health professionals to treat a range of issues from situational anxiety to frank depression to post traumatic stress disorder (Artenstein, 2005). The "walking wounded" may be outnumbered by the "walking worried", easily overwhelming local healthcare resources (Lee, 2007).

Health Promotion/Health Protection/Prevention

As statutory changes and nursing practice adjusts to bioterrorism as a norm, the OEHN will incorporate principles of health promotion and prevention into policy, training, education, and every day practice (Rogers, 2003). The OEHN must take an active leadership role in nursing organizations to educate and influence change in biological preparation and health promotion.

Health/Hazard Assessment and Surveillance

The OEHN will have to respond to biohazard exposure in the workplace as employees report with clinical signs and symptoms of disease processes and occupational injuries. Astute triage skills are critical for early recognition of signs and symptoms in an anthrax attack (Lee, 2007).

Workplace Surveillance and Hazard Detection

The OEHN and response team routinely conduct active workplace surveillance and identification of hazard risks. In the event of suspicious behavior, the employer and employee assistance professionals will investigate and address the

problem. A policy developed by human resources for dealing with unacceptable behavior is necessary (Rogers, 2003).

Occupational Health/Primary Care

The OEHN is key in the planning and education processes for an organization (Rogers). The nurse must be well versed in biological agents such as anthrax and understand how to apply effective emergency plans in case of an exposure. This preparation will reap significant benefits in methodical exposure management, casualty care, and positive outcomes.

Case Management

The Rogers' model cites case management which requires a thorough understanding of the consequences of anthrax exposure, plans for recovery from such an exposure, and goals for returning ill or injured employees to work. An understanding of the exposure and the short-term/long-term disability system is necessary (Rogers).

Counseling

Counseling of staff and workers requires prior understanding of the agent, exposure, treatment, return-to-work expectations, disability goals, and desired outcomes. Again, understanding the exposure and the short-term/long-term disability system would be beneficial to staff (Rogers).

Training/Education

Annual training and education of staff requires the use of research-based updates in anthrax care from the CDC. The OEHN is in a prime position to educate employees about the response plan (Rogers). Visual aids such as power

point presentations on the response plan would be useful in communicating meaningful information to staff and employees alike.

Research

The OEHN must not only understand basic anthrax care, but remain updated with information from the CDC and other professional sources of information (CDC, 2009b). Deemy (2003) believes that in the absence of known facts, the OEHN must glean facts from the literature, attending to and incorporating details and knowledge of reports of biological training events, and experiences to prepare for a potential exposure at the worksite.

Outputs

Preventing Illness and Injury, Occupational and Non-Occupational

The OEHN is in a key position to understand the preventive measures in illness and injury (Rogers, 2003). Expanding knowledge about the management of anthrax will require individual commitment, and personal discipline to research and keep current in emergency responder care, treatment modalities, and availability of nearest medical resources and services.

Risk Reduction

Risk reduction will necessitate routine teaching of staff on the basic characteristics of anthrax, risk potential, emergency plans, readiness of personal protective equipment and periodic drill in the management of an anthrax exposure event. The OEHN is a critical part of the successful planning, management, and teaching processes at their worksite (Rogers). Emergency planning, triage, and

community resources requires knowledge of the staff and the available services at local facilities.

Improved Worker Health/Safety/Working Conditions

Adult learning principles demonstrate that workers who are well prepared to respond to emergencies through active participation in education and training respond much more effectively to real life emergencies (Larsen, 2007). Periodic review of the emergency response plan in the policy and procedure manual via computer-based training and education sessions will assure that all workers are aware of the expectations in an anthrax attack, including use of appropriate personal protective equipment.

Better Quality of Life

Employees who observe proactive and proven safety measures in response plan training will be more satisfied with their general work environment. They will be aware that management has planned for a biological attack which intuitively reassures employees of safety in the workplace and management's interest in quality of life (Rogers, 2003). With the looming threat of a biologic attack, "security needs to become as intrinsic to corporate America as safety" in the workplace (Larsen, p. 209).

Cost Containment

The cost to implement response plan training and preparation should be noted in the beginning of the process. However, the savings may prove immeasurable in direct and indirect savings in human and facility resources.

Feedback

Goal Achievement

Goals in a response plan should be clearly written. They must support the objectives of the business's organizational plan, budget, and funding cycles.

Quality Assurance

Specific desired outcomes should be identified in the beginning of a response plan. The outcomes should be clear, succinct, and address plan processes with the appropriate organizational questions: Does the employee understand the meaning of the communications systems during a biological attack? Does the employee know and demonstrate how to properly don his/her PPE? Can the company successfully recover from an attack? Does the plan actually work? (Larsen, 2007).

Budget Performance

Biological defense will be expensive, particularly at the onset of planning and initial expenses (Larsen). Plans for a general response plan should be incorporated into budget cycles. Farsighted managers might introduce the concept with a basic funding line with their clinic budget. This simple step brings positive attention to management's commitment to current safety and health issues. The funding line will most likely be consumed in training, education, and multi-purpose personal protective equipment (PPE). When PPE is multi-purpose in its design and function, cost effectiveness becomes more acceptable to managers and budget planners.

Healthcare Trend Analysis

Tracking and trending processes, associated risks, and costs associated with injury and illness from the OSHA log form the basis for major health expenditures. Objectives could then be tailored for developing a program with the appropriate indicators and processes. Response planning for a biologic attack may identify areas for improvement and cost savings within the worksite.

Satisfaction Surveys

Satisfaction surveys reflect the culture and the regard to which employees value the effectiveness of worksite services. Rogers (2003) writes that the value of an occupational health program is measured by the respect to which the employees hold those services. Employees must be taught the organizational response plan, the importance of PPE, and required actions to survive. For the OEHN, the ultimate success of a biological response plan translates into survival.

Cost Effectiveness

Budget analysis needs may prove initially difficult to justify. However, identifying risk management issues associated with a biological attack may open the door to basic funding and planning discussions.

With the comprehensive nature of systems theory in mind, the Rogers' model allows the OEHN to effectively address and capture the concept and scope of a response plan within the organization. The model gives the OEHN a framework to identify influences both outside and inside the organization. The systems and subsystems prompt the OEHN to ask questions and coordinate planning steps.

CHAPTER V

DISCUSSION AND RECOMMENDATIONS

In contrast to a dirty bomb or car bombing which by nature would be a well-defined, distinct event, biological events are stealth, blurry, and insidious by nature, taking a period of time up to days or weeks to manifest. Therefore, healthcare providers must be aware and ready for a host of variables in exposure, dispersion, incubation, and clinical presentation (Schoch-Spana, 2003). Nursing experts studying these disease processes have identified distinct principles for approaching and managing unknown scenarios. Specifically, one medical expert in biological defense and infection control acknowledges the astute observations of internists in the 1999 New York City West Nile outbreak, the 2001 anthrax attack cases, and the 2003 SARS epidemic (Lee, 2007).

Resources and Supplies

Likewise, within an organization, effective planning demands resources and supplies needed based on the hierarchy of human needs (Larsen, 2007). Similarly, the OEHN is crucial in the planning of supplies, resources, in-place sheltering, transportation, and communication requirements. As such, these plans must be applicable and convey a sense of worth to the organization and value to the employees. To shift this thinking process and make it malleable, practical, understandable, and easy to understand, Larsen writes that people must be prepared to translate personal and home requirements into business requirements.

From a practical standpoint, the supplies identified in Tables 5.1 and 5.2 should be gathered, organized, and scaled to the size of the organization and

TABLE 5.1

PERSONAL BIOLOGICAL ATTACK CHECK LIST

Item	**Notes/Where to Find Supplies**
1. AHA Basic Life Support training	
2. Red Cross First Aid training/kits with medical supplies	
3. Five days of nonperishable food	
a. peanut butter	
b. canned tuna	
c. canned fruit	
d. nuts	
e. energy bars	
f. crackers	
4. Two weeks of drinking water and supplies per adult. Plan one gallon for drinking and hygiene purposes	
5. Flashlights with fresh batteries/bulbs	
6. Portable TV/radio and batteries	
7. Cash, coins, credit cards	
8. Copies of major family/med records	
9. Individual changes of clothing and feminine supplies	

Source: Adapted from Larsen, 2007

TABLE 5.2

PROFESSIONAL BIOLOGICAL ATTACK CHECK LIST

Item	Notes/Where to Find Supplies
1. First aid kit containing non-sterile bandages of various sizes and shapes	
2. Sterile dressings	
3. Tape/wipes	
4. Medications to include antibiotic ointment	
5. Scissors/tweezers	
6. Cold packs	
7. N-95 face masks/shields, gloves, shoe covers	
8. First aid manual for teenagers and younger children	
9. Aspirin for minor headache discomfort pain	
10. Anti-diarrhea medication for gastrointestinal distress	
11. Antacids for gastrointestinal reflux issues	
12. Activated charcoal for potential accidental toxic ingestion	
13. Contact lenses for personal use	
14. Extra eyeglasses for backup	
15. Tool kit for emergency repairs	
16. Toilet paper for personal hygiene	
17. Towelettes for personal hygiene	
18. Complete changes of clothing	
19. Matches to start pilot lights on gas heaters	
20. Feminine hygiene supplies	
21. Dental needs to include general care items and floss	
22. Food utensils for nourishment as well as tool use	
23. Paper towels for clean up	
24. Paper and pencil for practical use	
25. Books, games, puzzles for children	
26. Fire extinguisher for immediate safety concerns	

Source: Adapted from Larsen, 2007

potential response. Expiration dates must be checked and supplies rotated to keep the materials usable. Within an organization, these resources should be kept in a central area where personnel can locate and retrieve the supplies with ease.

Communication

The OEHN should provide clear and concise communication to employees which instills a sense of personal control. Effective communication systems must be planned and in place. Given access to computers, one source might include the CDC (2009a) anthrax exposure message templates for standardization of emergency information.

Infection control principles must be sound in application. Isolation means a defined location with ventilation, medical capability, and nursing resources, such as a polyfiber tent in a remote location with positive pressure, butyl rubber PPE, electrical power, and a water source. It might mean the isolation room next to the entrance to an emergency department with negative air flow. Adequate transport resources must be identified with equipment appropriate for anthrax management.

Knowing transmission patterns, appropriate PPE and current information regarding methods of protection will allow the most effective management of anthrax exposure (Salazar, 2002). It is absolutely crucial that organizations plan for emergency supplies; the OEHN can effectively drive that process.

In short, as part of the re-design process, the new Department of Homeland Security Chief Medical Officer presented to the 2006 graduates of the University of North Carolina's School of Public Health Policy and Administration certificate program, "We must reorganize to plan for disease attacks by protecting people...at

a local level…" (University of North Carolina Chapel Hill School of Public Health [UNC CH SPH], 2006).

Current literature acknowledges there is a shortage of nurses, specifically OEHNs. OEHNs are experts in disease surveillance processes (Akins, Williams, Silenas & Edwards, 2005). Larsen (2007) states a reorganization of the public health infrastructure and systems is absolutely necessary to serve the security needs with emphasis on "regions" instead of the current public health infrastructure which he likens to "an organization with little to no funding, only one tank, a platoon and an airplane...where promotion was not based on competency, but political connections" (p. 110).

Transportation, Shelter, and Evacuation

The science of planning translates into information management of goals, processes, emergency contacts/numbers, employee expectations, family awareness, and expected outcomes in the ability to survive and operate (ATSO) phase of an anthrax attack. The art of this planning is the absence of panic and disorder through preparation, training, and organization-wide sharing of outcomes and expectations. Sheltering in-place may be the safest of all phases of transportation (Larsen). Returning home safely and intact at the end of this experience is the final proof of success.

Policy

In the Rogers' model, a succinct, written, coordinated disaster policy and plan must address key topics such as management of prevention and containment of injuries, as well as guidelines for managing exposure, points of contact, and

realistic expectations for services and care. This plan must be written prior to any exposure event (Salazar, 2002). Experts acknowledge that the planning process will not be straight-forward or linear in ease of design (D'Alessandro & D'Alessandro, 2005).

Knowledgeable employees must be incorporated as partners within the organization. Larsen (2007) emphasizes "prior deliberate/crisis planning, testing systems frequently, and paying attention to detail" insures consistency in outcomes (p. 203).

Recognizing key individual talents and skills and recruiting them for their abilities, Larsen notes that employees are likely to facilitate a better coordinated response, use their resources well, and assure their own and co-workers' safety. Conversely, from management's perspective, individual response may pose real challenges to the worksite leadership team. Deemy (2003) states that in a biological attack, decisions to treat or not to treat in large groups of patients conditioned to access to "premium care" will add to ethical dilemmas.

The OEHN must think beyond the local over-tasked hospital for resources. Larsen believes that even with stringent efforts and excellent preparation, given an attack, only a fraction of lives can be saved. The OEHN must be prepared to serve as a knowledgeable public health resource in conjunction with state and local resources (Salazar).

Research

Work is already in progress to address clinical responses and bio-behavioral consequences after exposure to biological agents. Focused on the sudden,

unexpected nature of the biological attack, these researchers emphasize the absolute requirement for proactive planning, proven communication systems, and demonstrated preparedness in first responder teams.

Nursing experts recommend future research in the following areas:

1. Early detection
    - Commercial software treatment algorithms to detect biological attack backed up by manual processes.
2. Understanding of exposure
    - Vectors and modes of transmission of airborne anthrax.
3. Biobehavioral responses to threats and injury
    - Understanding of toxic agents and their effects, knowledge of the disease process, appropriate isolation procedures, and treatment.
4. Biodefense planning and response capacities
    - An assessment of current resources on-hand versus community supply/demand.
    - Current planning and response capacities evaluated for organizational "fit".
    - An assessment of what the organization can do for itself and where plans and resources may need to be altered.
5. Potential bioethical issues
    - An assessment of injury, resource consumption, and potential life saving, keeping in mind that the most injured, sickest patients may not survive.

6. Research training
    - Incorporation of nursing science into biological defense with systems modeling and planning.
7. Partnerships in funding and research
    - Nurse researchers must be engaged in partnerships to strengthen their contribution to biodefense such as the NIH General Clinical Research Centers and the Department of Veterans Affairs (Sigmon & Larsen, 2003).

Education

Current writers acknowledge the lack of standard education for nurse providers mixed with a shortage of public health nurses (Akins et al., 2005). Evolving education in biological agents, planning for management of clinical injuries, as well as educating employees requires proactive nursing leadership. Nursing knowledge specific to the Category A agents is critical to planning, response training, and managing strategies in bioterrorism. Preparedness at the individual level is crucial to success. At the individual level, one author states the OEHN must master four crucial skills: visibility, congruency, emotional intelligence, and communication. The OEHN must realize the importance of credibility in the workplace, particularly during a time of crisis (Strasser, 2002). As part of the general nursing education, these introductory skills combined with a baseline knowledge and competencies in bioterrorism agents must be instilled into baccalaureate programs and updated through periodic continuing education. The OEHN must know how to recognize a biological attack, organize an effective response, and manage the exposure with calm and deliberate thought and actions.

Conclusion

The occupational and environmental health nurse is in the right place to make revolutionary changes in nursing practice based on scientific evidence and knowledge. The OEHN knows government efforts have appeared well-funded in the past, but now are in jeopardy with budget cuts; many have fairly well-developed websites citing internal plans shielded from the public domain. However, the government agencies observed are immature, disjointed, and amateur in their problem-solving processes. The literature reveals patchy and poorly coordinated processes in joint planning, policy, research, education, and ultimately, practice processes (Larsen, 2007). Armed with that knowledge, it is up to the occupational health nursing profession to identify those processes, actions, and practices to protect individuals, employees, and worksites (Sigmon & Larsen, 2003). From blue prints and floor plans to step-by-step process definition and development to exercising those plans so that employees are prepared and know the plan, the OEHN has the knowledge base to define how to effectively and properly respond to an anthrax attack. The plan may not be perfect, but it should be useful and effective. Starting with the CDC website for emergency action planning and using Larsen's checklists, the OEHN can easily put together a reasonable action plan for a biological exposure. Armed with the appropriate resources, knowledge, and tools from the CDC, the OEHN may identify an appropriate location, shelter, supplies, equipment, and people resources into a simple, basic, and straightforward two week survival plan. Following suit with the Rogers' model, the OEHN is assured of thoroughness within a systems

framework. Systems theory thinking will improve successful and complete problem solving processes as the OEHN integrates the exposure plan into organizational-level plans.

Given the facts surrounding responses to previous biological attacks (Lee, 2007), the OEHN has the foresight and proactiveness in short- and long-term planning, and resource requirements. Creating a response plan to the threat of a biologic attack such as anthrax is a new, but attainable challenge to the OEHN planning skill set. Using the Rogers' model and the OSHA checklists cited, the OEHN is in a key position to ask the right questions, pull together current biological defense practices, develop and implement, and evaluate efficient work processes, and refine robust policies into a cost-effective, lifesaving response plan with desirable clinical outcomes. The OEHN must be willing to invest the time and effort. That time is now.

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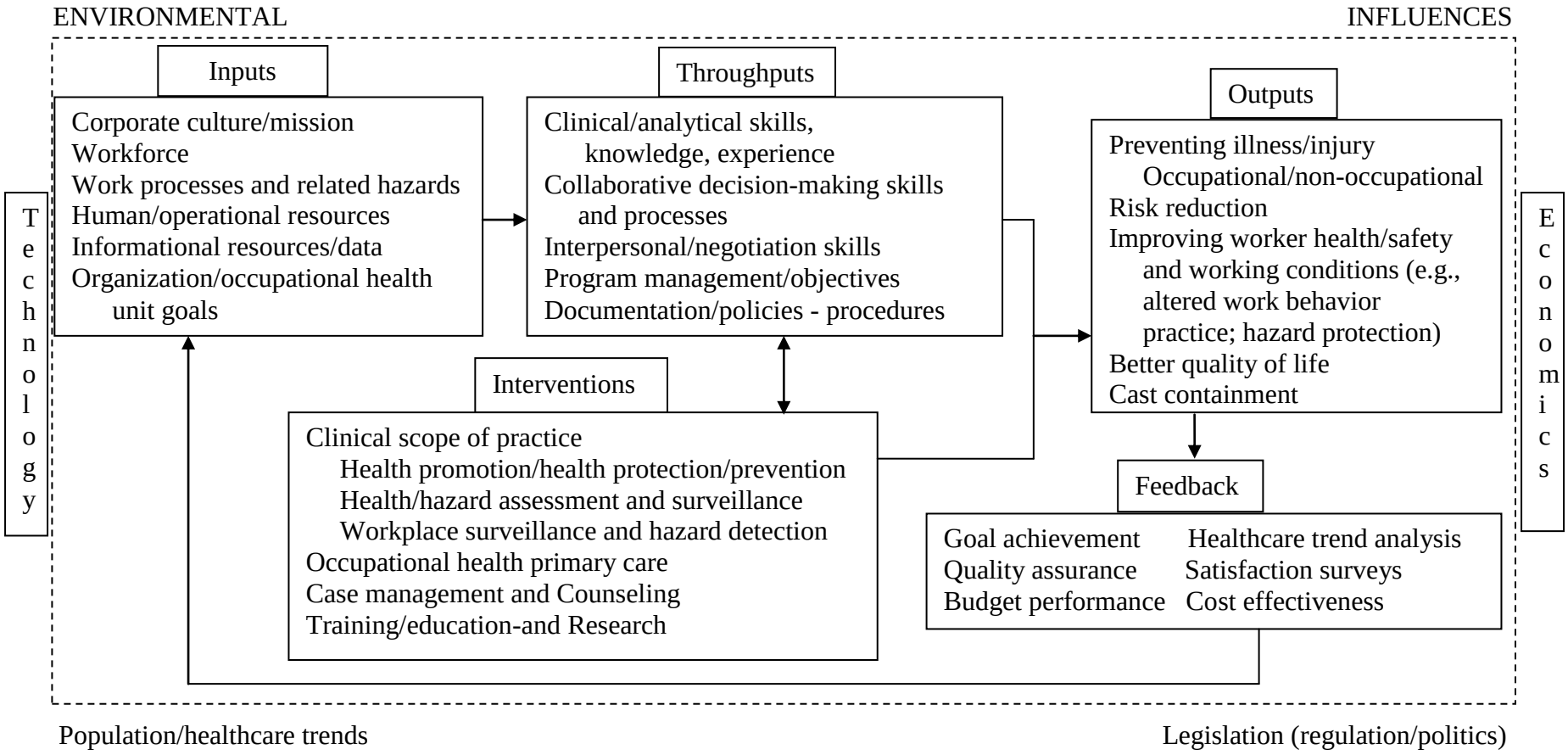
APPENDIX

ROGERS' CONCEPTUAL FRAMEWORK FOR OCCUPATIONAL HEALTH PROGRAMS AND SERVICES



Source: Rogers, 2003